



# PROFIBUS DP Communications for PanelView Terminals

## Overview

This document describes how to install, configure and create applications for a PanelView Operator Terminal with a PROFIBUS DP communication port. These topics are discussed:

Topic	Page No.
Overview	1
Related Documentation	2
Terminology	2
Allen-Bradley Support	2
European Union Directive Compliance	2
Overview of PROFIBUS DP	3
Introduction to PROFIBUS DP	3
Communication Between DP Masters and DP Slaves	4
PROFIBUS DP Network Example	4
PanelView PROFIBUS DP Connector	5
Cabling	5
Connections Using Type A Cable	6
Connections Using Type B Cable	9
PROFIBUS DP Data Exchange	12
Creating a PanelView PROFIBUS DP Application	22
Selecting a PROFIBUS DP PanelView Terminal	23
PanelBuilder Communications Setup	24
PanelBuilder Tag Editor	25
Overlapping Write Tags	27
Tags Using Multiple PanelView Data Base Words	28
Transferring PROFIBUS DP Application Files	28
Alarms	29
Reports	29
Validation Error Messages	29
Electronic Data Sheet	29
Terminal Communication Setup Screen	30
Changing the Node Address	32
Troubleshooting	33
Terminal Reminder, Error, and Warning Codes	33
Extended Diagnostic Bytes	35
PanelBuilder Error Messages	36
Network Connection Failures	37
Internal Errors	38
PROFIBUS DP Network Specifications	39
European Union Directive Compliance	40
Glossary	42

## Related Documentation

The following documents contain additional information concerning PanelView and PanelBuilder products. To obtain a copy, contact your local Allen-Bradley sales office or distributor.

For	Read this Document	Document Number
A complete listing of current Allen-Bradley documentation, including ordering instructions. Also indicates whether the documents are available on CD-ROM or in multi-languages.	Allen-Bradley Publication Index	SD499
A glossary of industrial automation terms and abbreviations	Allen-Bradley Industrial Automation Glossary	AG-7.1

## Terminology

A glossary of terms (at back of this document) provides definitions of commonly used words related to PROFIBUS DP communications. The PanelView and PanelBuilder user manuals also contain glossaries.

## Allen-Bradley Support

Allen-Bradley offers support services worldwide, with over 75 Sales/Support Offices, 512 authorized Distributors and 260 authorized Systems Integrators located throughout the United States alone, plus Allen-Bradley representatives in every major country in the world.

### Local Product Support

Contact your local Allen-Bradley representative for:

- sales and order support
- product technical training
- warranty support
- support service agreements

### Technical Product Assistance

If you need to contact Allen-Bradley for technical assistance, please review the information in the *Troubleshooting Section* first. Then call your local Allen-Bradley representative.

## European Union Directive Compliance

Refer to page 40 for details on installing the PanelView terminals in industrial environments requiring compliance with European Union Directives.

## Overview of PROFIBUS DP

The following sections describe:

- introduction to PROFIBUS DP
- communication between DP Masters and DP slaves
- PROFIBUS DP products available from Allen-Bradley

## Introduction to PROFIBUS DP

PROFIBUS DP is the performance-optimized version of PROFIBUS. It is a remote I/O protocol designed for high-speed data transmission between automation systems and distributed peripherals, such as remote I/O chassis or operator interface panels. PROFIBUS DP is most useful for time-critical communication.

There are two main devices on the PROFIBUS DP network: the DP Master(s) and DP slave(s). The DP Master acts as a requester of data from the DP slaves. A DP Master of controller type (Class 1) may also act as a responder to requests made from a DP Master of management type (Class 2).

The DP slaves act only as responders to a DP Master, implementing a defined set of functions. These functions are:

- data exchange
- check configuration
- set parameters
- read diagnostics
- get configuration
- global control (see Attention below)
- read output
- read input
- set slave address<sup>①</sup>

<sup>①</sup> Not supported by the PanelView terminal.



**ATTENTION:** Only Clear Data global control is supported by the PanelView terminal.

## Communication Between DP Masters and DP Slaves

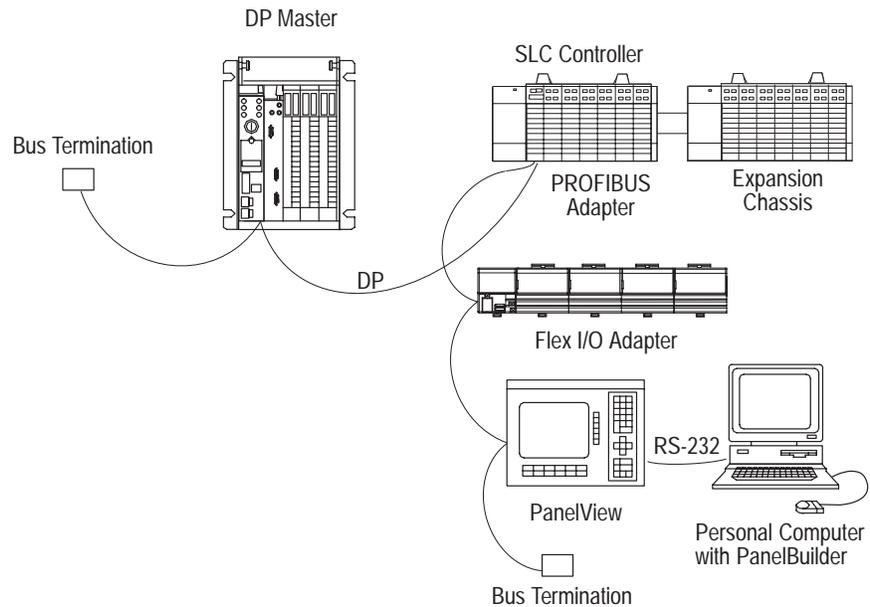
The PROFIBUS DP network uses polled communication. The DP Master sends information to and requests information from the DP slave. This is a cyclical exchange of information which occurs independent of the actual update of the databases by the DP Master and DP slave application.

Before data exchange begins, each device on the network must have a unique network address assigned to it. (See page 32 for information on setting the PanelView terminal address.)

To exchange I/O data with the DP slaves on the network, the DP Master must have parameter and configuration data for each DP slave. This data contains information such as the slave's bus parameters and data exchange module configuration.

## PROFIBUS DP Network Example

The illustration below shows an example network configuration.

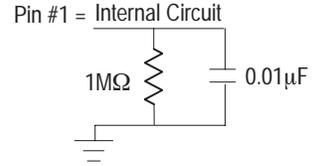
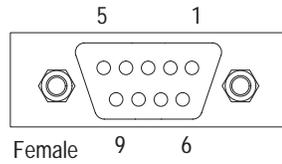


### For more information

If you need more information, contact your local Allen-Bradley integrator or sales office for assistance.

## PanelView PROFIBUS DP Connector

PROFIBUS DP is supported by the 9-pin Female D-Sub connector on the PanelView. The PROFIBUS connector is identified by the label on the PanelView. Refer to your PanelView user manual if you require more information.



- Pin #1 = Internal Circuit
- Pin #3 = Receive/Transmit +
- Pin #8 = Receive/Transmit -
- Pin #5 = Data Ground
- Pin #6 = +5 V

## Cabling

Two different types of cable are available, Type A (Daisy Chain) or Type B (T-Junction). For most applications, we recommend that you use type A cable, it is capable of better performance at greater distances, and supports 1.5M bits/sec communications.

Characteristic	Cable A Specifications	Cable B Specifications
Impedance	135–165 Ω (3–20 MHz)	100–130 Ω (f > 100 kHz)
Capacitance	< 30 pF/m	< 60 pF/m
Resistance	< 110 Ω/km	–
Wire Gauge	> 0.64 mm	> 0.53 mm
Conductor Area	> 0.34 mm <sup>2</sup>	> 0.22 mm <sup>2</sup>
Maximum Length <sup>①</sup> with a Baud Rate (bits/s) of:	≤ 93.75k	1200 m
	187.5k	1000 m
	500k	400 m
	1.5M	200 m
		1200 m <sup>②</sup>
		600 m <sup>②</sup>
		200 m <sup>②</sup>
		NA

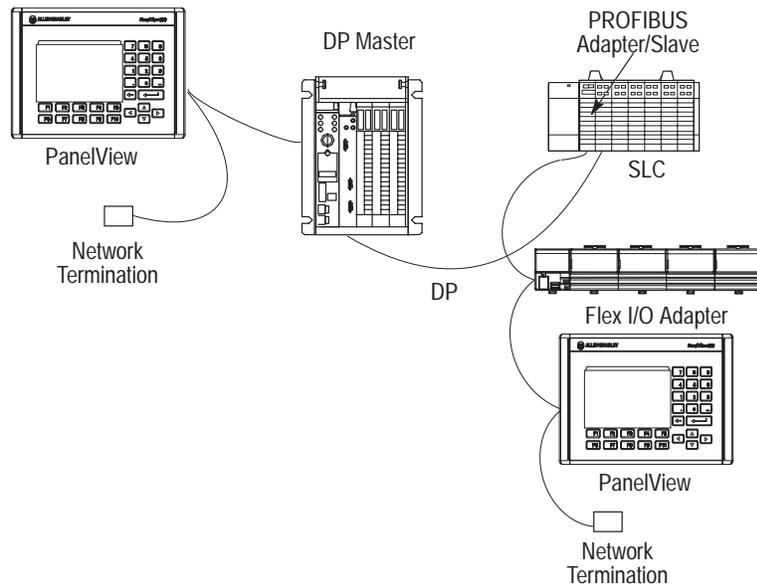
NA = Not Applicable

① If using a combination of both cable types, divide the lengths shown by two.

② This is the sum of all bus segment and drop cable lengths.

## Connections Using Type A Cable (Recommended)

Shown below is a typical network connection using Type A cable:



**Note:** For high noise environments, we recommend that the network connections be made using a “Daisy Chain” topology as shown above.

### Type A Cable

You must use a shielded twisted pair cable for all network connections. We recommend that you use Belden cable 3079A (for baud rates up to 1.5M bits/sec). The maximum cable length depends upon the baud rate, see table on page 5. The maximum number of devices on the same network segment is 32 (126 with repeaters).

### Type A Cable Connectors

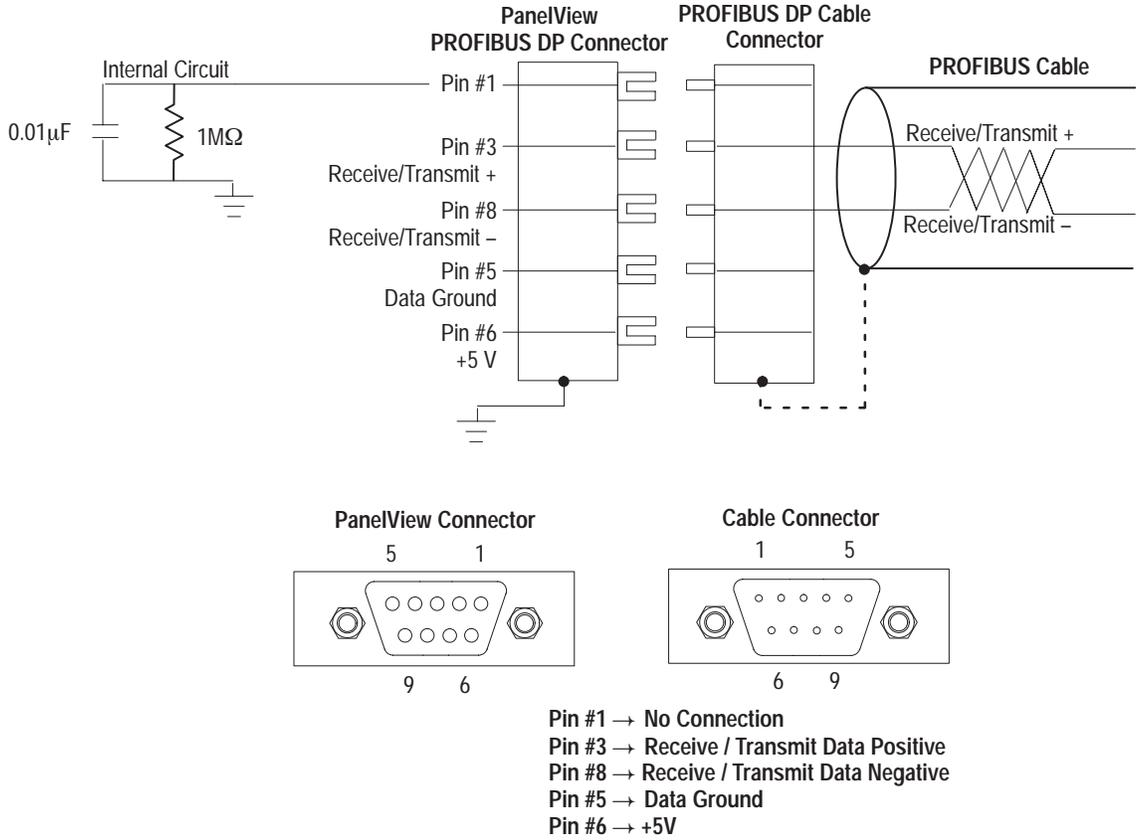
We recommend that you use one of the following connectors when creating a communication cable for the PanelView terminal. These connectors are compatible with the female 9 pin D-Sub connector on the back of the PanelView.

- Siemens 6ES5 762-1AA12 (45° Connector)
- Siemens 6ES7 922-0BB00-0XA0 (Straight Connector)

**Note:** Other cables and connectors of equivalent or greater functionality may be available from other sources.

### Connecting the Type A Cable

The following diagram shows how the Type A cable connects to the PanelView.

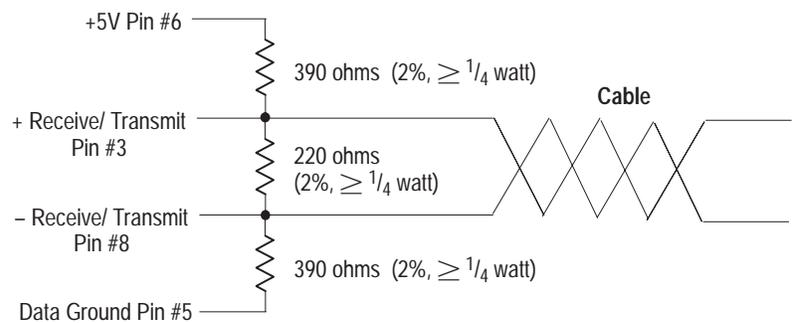


**Note:** Connect the cable shield to the metal shroud of the connector. The PanelView connector shell is connected to the chassis ground.

## Type A Cable Termination

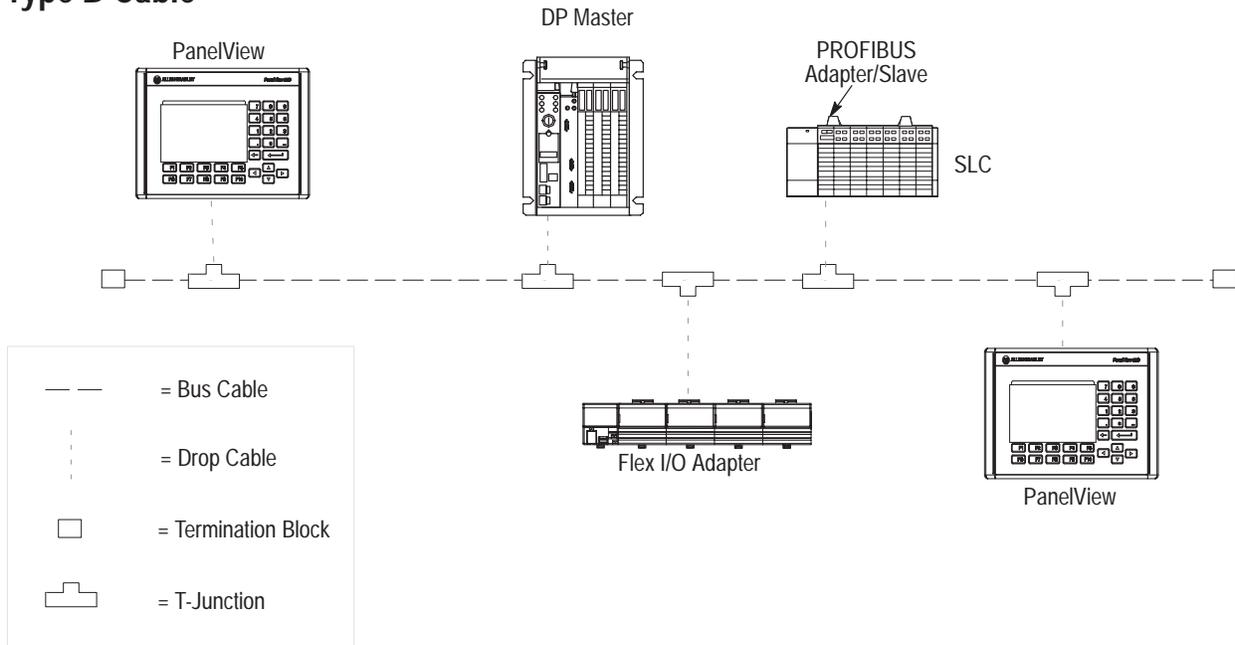
If the PanelView is the last device on a physical network, it must be terminated. The recommended connectors (page 6) have integral terminating resistors. Terminate the cable by moving the termination switch on the connector to the ON (Terminate) position.

If you are using a connector that does not have terminating resistors, terminate the cable as shown below.



## Connections Using Type B Cable

Shown below is a typical network connection using Type B cable:



### Type B Cable

When using type B cable, T-Junctions allow devices to be added or removed without breaking the network. We recommend that you use Type B cable for baud rates up to 500K bits/sec. The maximum number of devices on the same network segment is 32 (126 with repeaters).

### Type B Cable Accessories

We recommend that you use the following drop cables, T-junctions, and termination blocks connectors available from Sprecher + Schuh.

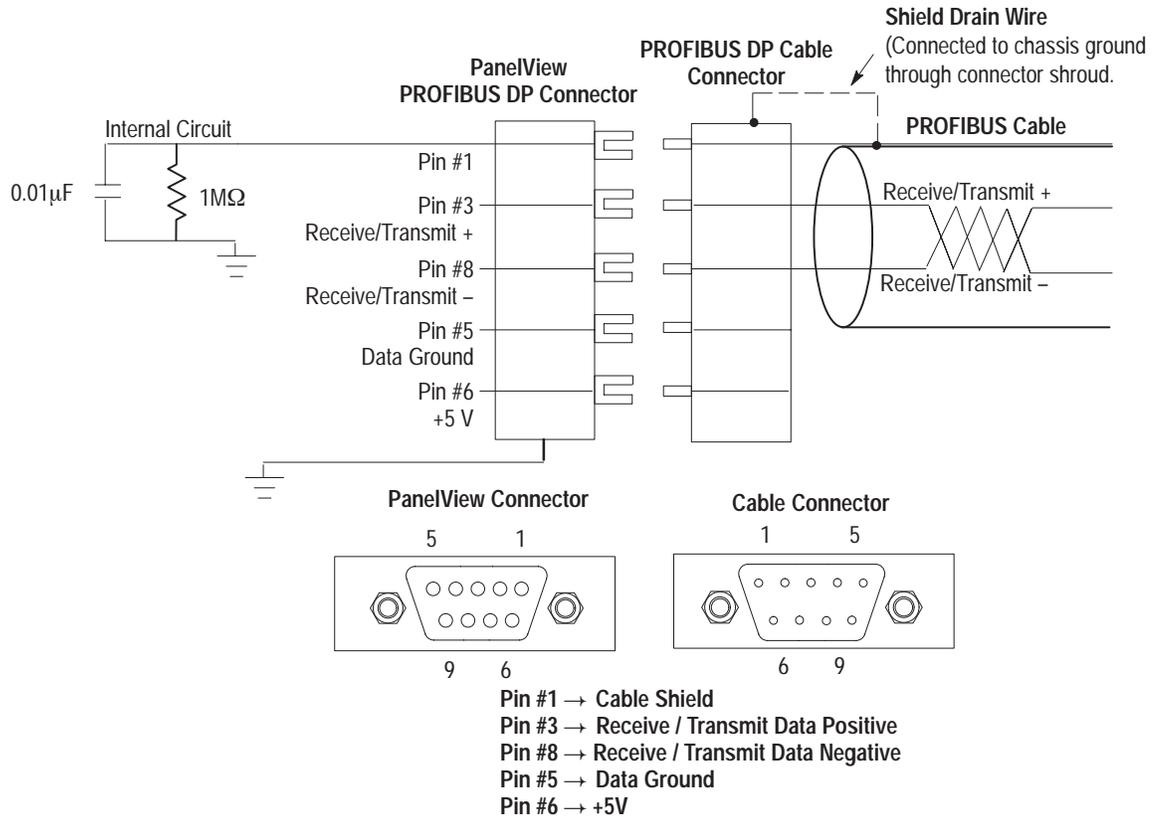
Item	Catalog Number	Description	Sprecher + Schuh No.
Drop Cables <sup>①</sup>	PTL-02	2 meter (6.6 ft) cable	87.890.280-02
	PTL-04	4 meter (13.1 ft) cable	87.890.280-04
	PDC-10	10 meter (32.8 ft) cable	87.890.282-10
T-Junction Connector	PTS-0	Connects drop cable to the main network cable.	87.890.276-01
Termination Block	PCE-0	Contains resistors to terminate a network end.	87.890.284-01

<sup>①</sup> We recommend that you use the shortest possible drop cable.

**Note:** Other cables and connectors of equivalent or greater functionality may be available from other sources.

## Connecting the Type B Cable

The following diagram shows how the Type B cable connects to the PanelView.



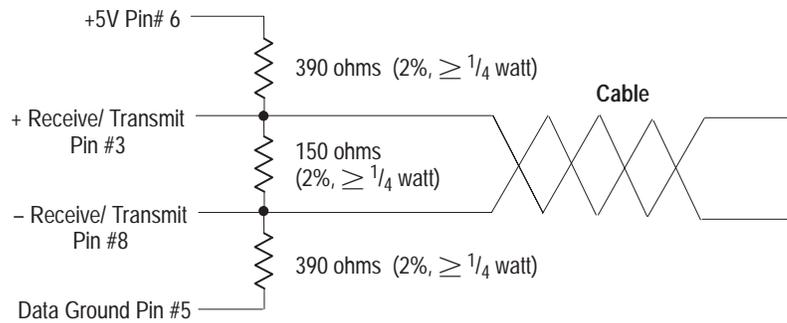
**Note:** Connect the cable shield to Pin 1 of the connector. For compliance with European Electromagnetic Compatibility (EMC) directives, also connect the cable shield to the metal shroud of the connector on both sides of the connection.. This connects the cable shield to chassis ground through the connector shroud and bypasses the R/C filter.

**Important:** For improved noise immunity in long distance networks, an alternate wiring connection may be preferred to avoid dc and low frequency ground loops. In such cases, connect the cable shield directly to the local chassis ground (through connector shroud) at **only one point** on a PROFIBUS DP network.

## Type B Cable Termination

If the PanelView is the last device on an end of a network, it must be terminated at the PROFIBUS DP connector or T-junction. Use the recommended terminating blocks (page 9).

If you do not have terminating blocks available, terminate the cable as shown below.



**Note:** The bus cable should be grounded to an earth ground only at one point on the network.

## PROFIBUS DP Data Exchange

The following sections describe how data exchange occurs on a PROFIBUS DP network.

### PanelView Data Exchange Modules with DP Master

The PanelView always exchanges the following four blocks when configured by the Generic Electronic Data Sheet (.GSD):

- Real Time Output Module
- Real Time Input Module
- Multiplex Output Module
- Multiplex Input Module

Each module is 16 words in length. Real Time and Multiplex modules are continually exchanged with the PROFIBUS DP Master. Details of configuring the PanelView terminal, building PanelView applications, and implementing the multiplex module handshake mechanism will be covered in later sections.

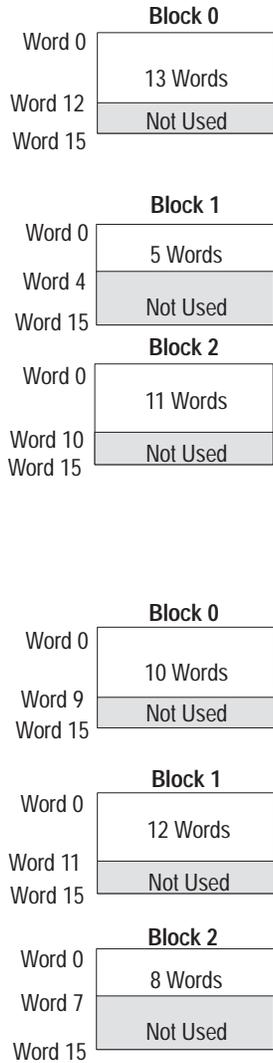
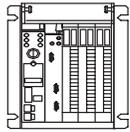
When communication begins, the PROFIBUS DP Master sends the DP slave bus parameter data and information on the expected PROFIBUS DP slave's module configuration. After receiving the data, the PROFIBUS DP slave compares this information to its actual configuration. If the DP Master's information does not exactly match the slave's actual configuration an error is reported by the PanelView and no communications occur (refer to troubleshooting section).

### PanelView and DP Master Databases

The PanelView database consists of up to 128 input and 128 output blocks. Block 0 is 16 words in length and blocks 1 to 127 are 15 words in length. When communication occurs over a PROFIBUS DP network, these blocks are transferred into and out of the various PanelView data exchange modules. Blocks and Modules are associated as follows:

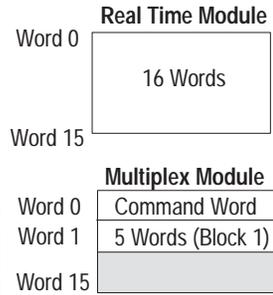
- Output Block 0 is associated with the Real Time Output Module
- Input Block 0 is associated with the Real Time Input Module
- Output Blocks 1 to 127 are associated with the Multiplex Output Module
- Input Blocks 1 to 127 are associated with the Multiplex Input Module

### DP Master Data Base



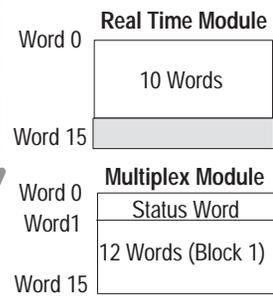
DP Master Program

### Output Modules Exchanged Over Network



Network Link

### Input Modules Exchanged Over Network

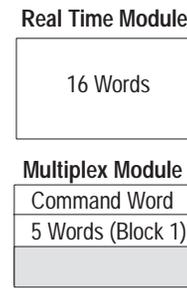


Network Link

### PanelView Data Base

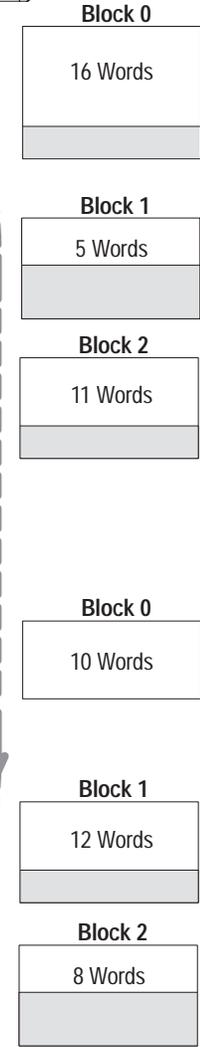
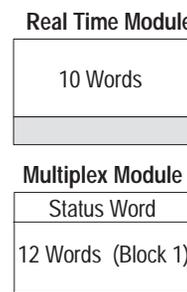


### Output Modules Exchanged Over Network



PanelView Code

### Input Modules Exchanged Over Network



**Real-Time Module Data Exchange**

Real Time data is automatically exchanged and updated in the DP Master's real-time module without any action required by the DP Master. There is no confirmation (handshaking) to indicate the availability of new data. Use the real-time modules to transfer data that must be updated most frequently.

Real Time I/O is limited to a maximum of 16 words of both input and output data.

**Note:** Real Time module data is not consistent.

**Multiplex Module Data Exchange**

New multiplex data blocks are exchanged when a request is made by the DP Master's program. The "command word" (word 0) in the multiplex output module and the "status word" (word 0) in the multiplex input module are used to manage the exchange of multiplex data blocks.

Since a module is 16 words in length, the amount of data in a multiplex input or output block is up to 15 words. The DP Master program is responsible for managing the command and status words and for moving multiplex blocks in or out of the multiplex modules.

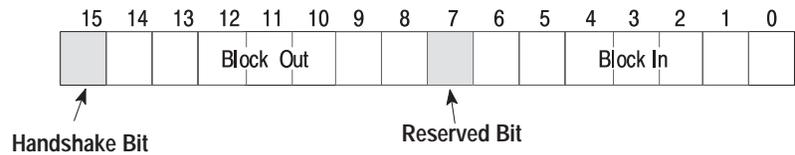
**Note:** Multiplex module data is consistent.



### Status Word

The first word of the multiplex input module contains handshake status information from the PanelView terminal. The status word indicates the progress of a multiplex module data exchange to the DP Master. In addition, the status word is read-only to the DP Master.

The status word has the following structure:



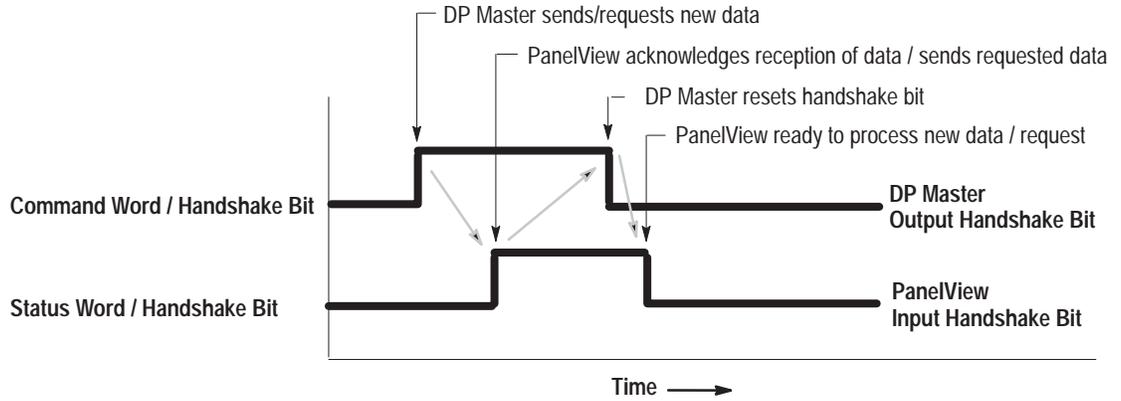
The Block In field is 7 bits wide and specifies which input block (1..127) is being returned from the PanelView terminal's database. A value of 0 indicates no multiplex input block is being returned. This can happen for two reasons: 1) no multiplex input block was requested, or 2) the multiplex input block requested does not exist in the PanelView terminal's database.

The Block Out field is 7 bits wide and specifies the output block (1..127) that was sent to the PanelView terminal's database. A value of 0 indicates two possible events: 1) no multiplex output block was sent, or 2) the multiplex output block sent does not exist in the PanelView terminal's database.

The Handshake Bit is set to 1 by the PanelView terminal to acknowledge that a multiplex module data exchange has taken place. The DP Master's program is responsible for checking the Block In and Block Out values to determine if the exchange took place successfully.

### Multiplex Module Handshaking

It is the DP Master's role to manage the handshake operation. This is accomplished by initiating an exchange using the multiplex output module's control word and monitoring progress of the exchange in the multiplex input module's status word. The timing diagram below shows the operation of the Handshake Bit controlled by the DP Master and the one controlled by the PanelView terminal.



The following outlines the steps required to initiate and complete a multiplex module data exchange from the DP Master.

**DP Master:**

- Before initiating the exchange, both the control word and status word handshake bits must be 0.
- If multiplex output data is being sent to the PanelView terminal, the multiplex output block's data must be copied into the multiplex output module's data area in the DP Master database (starting at word 1).
- The multiplex output block number must be placed in the multiplex output module's control word (the Block Out field).
- If multiplex input data is being requested from the PanelView terminal, the multiplex input block number must be placed in the multiplex output module's control word (the Block In field).
- The exchange is initiated by setting the handshake bit in the control word to 1.

**PanelView:**

- When the PanelView terminal detects the handshake bit in the control word is set, any further processing is based on the value of the Block Out or Block In fields. If the Block Out number is non-zero, it will copy the multiplex output module data into the corresponding multiplex output block in the PanelView's database. If the Block In number is non-zero, then it will copy a multiplex input block from its database into the multiplex input module. The status word's handshake bit is set to 1 to indicate to the DP Master that the PanelView processing is complete.

**DP Master:**

- The handshake bit in the status word is monitored until a 1 is detected. If a multiplex input block was requested it may then be extracted from the multiplex input module and copied into the DP Master's database. Also, any error checking of the status word's Block In or Block Out fields must take place at this time.
- The DP Master acknowledges completion of the exchange by setting the handshake bit in the control word to 0.

**PanelView:**

- When the PanelView detects the DP Master has cleared the handshake bit in the control word, the PanelView acknowledges completion of the exchange by clearing the handshake bit in the status word to 0.

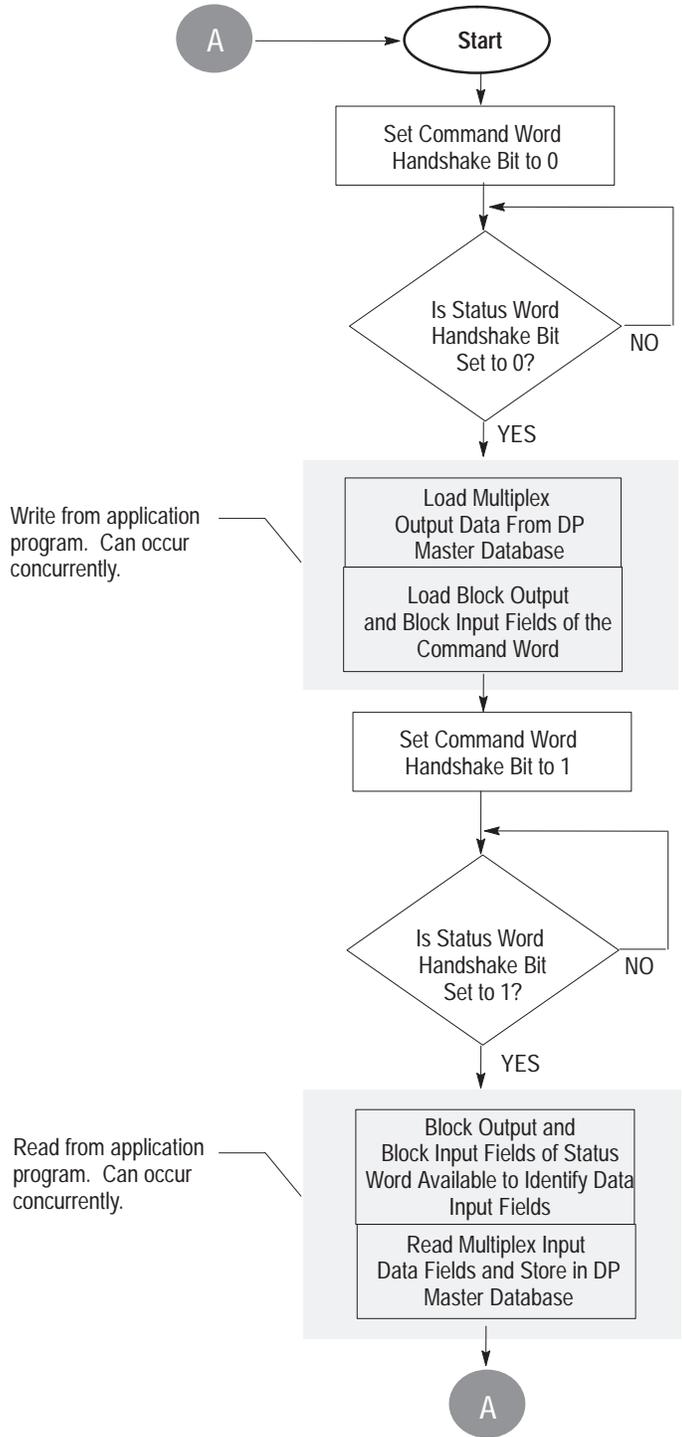
**DP Master:**

- The handshake bit in the status word is monitored until a 0 is detected. Then the DP Master may initiate another multiplex module data exchange.

**Note:** Only one multiplex module data exchange operation can be in progress at any one time.

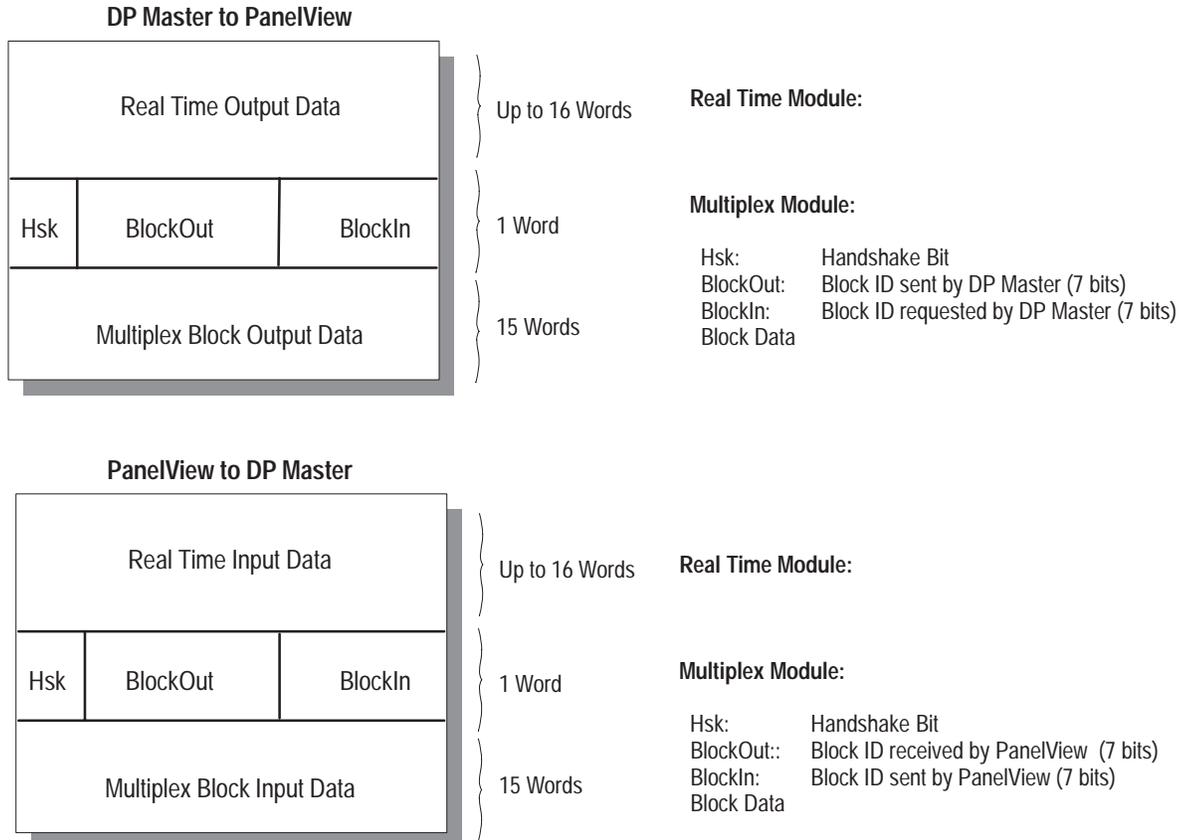
### Handshaking Flow Chart

Multiplex Inputs and Outputs are available to the DP Master by management of the handshake words. Use the following flow chart to assist in creating and implementing the control program.



**Note:** Performing a multiplex module data exchange requires a number of poll cycles from the DP Master to the PanelView terminal. During each of those poll cycles real time data is constantly being exchanged.

The diagram below shows the relative position of the Real Time and Multiplex modules in the data packet sent between the DP Master and the PanelView terminal. The modules reside in the DP Master's database in the same relative position.



## Multiplex Handshake Error Processing

When the PanelView receives a new command word from the DP Master (handshake bit is set to 1) it verifies that the Block Out and Block In numbers have been allocated in the PanelView terminal's database.

- If the Block Out number is invalid, the PanelView will set the Block Out number of the status word to 0 and ignore the data sent by the DP Master in the multiplex output module.
- If the Block In number is invalid, the PanelView will set the Block In number of the status word to 0 and set all of the data in the multiplex module to 0. The DP Master should then ignore the data.

In either case, the following occurs:

- the PanelView sets the status word's handshake bit to 1 to acknowledge the DP Master request.
- the corresponding extended diagnostic bytes are generated (see page 35).

We recommend that your DP Master program verify that the block numbers received in the status word match the block numbers sent in the control word. If they do not match, the master program should execute an error processing routine.

## Creating a PanelView PROFIBUS DP Application

All PanelView applications are created using PanelBuilder software. Refer to the PanelBuilder software user manual for instructions on how to configure the PanelView terminal.

The following are typical steps for developing a PanelView application for a PROFIBUS DP network:

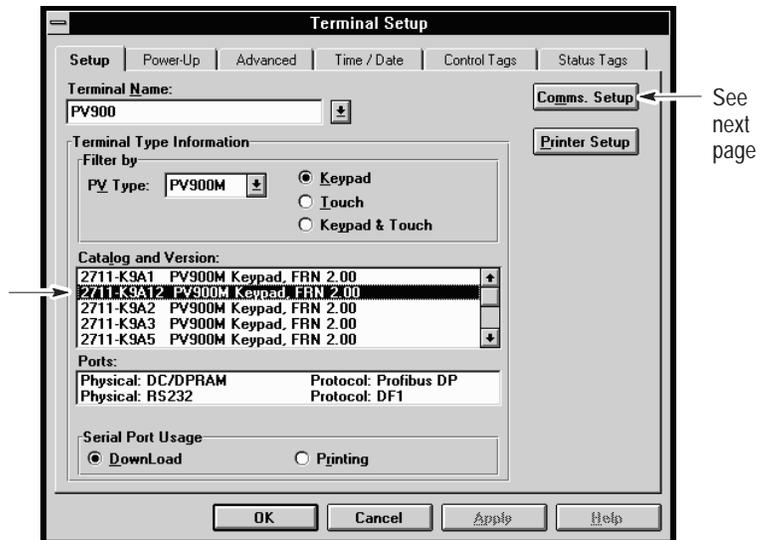
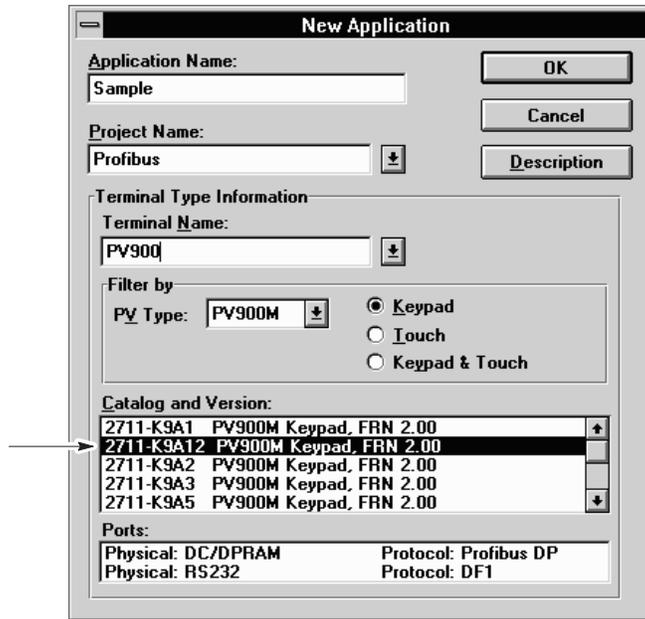
1. Create the PanelView PROFIBUS DP application using PanelBuilder software. Assign control or display objects to Real Time or Multiplex block addresses.
2. Validate and download the application to the PanelView terminal.
3. In the protocols/profibus directory, locate the electronic data sheet for the application. Page 29 describes the electronic data sheet. The electronic data file contains data exchange sizes and other information specific to the application.
4. Use a PROFIBUS DP network configuration utility import function to load the PanelView's electronic data sheet. If your network configuration utility does not have an import function, you will need to manually enter the information from the electronic data sheet. Refer to the user manual for the PROFIBUS DP network configuration utility you are using.
5. The PROFIBUS DP network configuration utility should also allocate the data in the controller memory associated with the each DP slave device on the network.
6. Develop your DP Master program using the addresses mapped by the PROFIBUS DP network utility.

## Selecting a PROFIBUS DP PanelView Terminal

Select a PROFIBUS DP terminal for a PanelView application from:

- New Application dialog when creating a new application
- Terminal Setup dialog when converting the application created for another terminal

Any catalog number with “12” as the last two digits is a PROFIBUS DP terminal.



See next page

## PanelBuilder Communications Setup

Select Terminal Setup from the PanelBuilder Application menu. Click the Comms. Setup button to open the Communication Setup dialog for PROFIBUS DP.



**ATTENTION:** The PROFIBUS DP protocol mechanisms do not provide the ability to detect and report a duplicate node address between a DP Master and slave device, or between two slaves (only between two DP Masters).

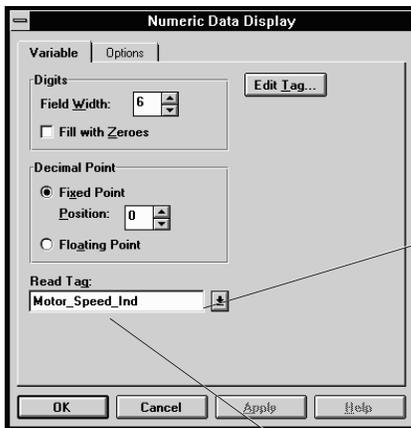
The Communication Setup screen allows you to assign a node address (from 1 to 125) to the PanelView terminal. The default address is 7. Each device on the PROFIBUS DP network must be assigned a unique address. The address you set here will appear in the New Address and Active Address fields on the Terminal Communication Setup (screen shown on page 30) after the download.

## PanelBuilder Tag Editor

The PanelView terminal is a slave device on a PROFIBUS DP network and only responds to commands from a DP Master device. The DP Master program reads and writes PanelView object tag values to its database at regular intervals.

The DP Master programmer must know where the data blocks are stored and their content. The PanelBuilder tag editor defines the controller addresses of the tag data.

The same tag editor described in the PanelBuilder User manual (Publication No. 2711-6.0) assigns tag information for PROFIBUS DP communications (exceptions are noted on the following page).



Tag Name	Data Type	Description	Node Name	Address	Init
Motor_AutoManual	Unsigned Intec	Motor auto/manual indication.	Profibus_Data_Table	P11:2	0
Motor_Speed	Unsigned Intec	Controls motor speed.	Profibus_Data_Table	P11:3	0
Motor_Speed_Dec	Bit	Decrements motor speed.	Profibus_Data_Table	P11:4/0	0
Motor_Speed_Ind	Bit	Increments motor speed.	Profibus_Data_Table	P11:4/1	0
Motor_Speed_Ind	Unsigned Intec	Indicates motor speed.	Profibus_Data_Table	P11:5	0
Motor_Start	Bit	Starts motor.	Profibus_Data_Table	P11:4/2	0
Motor_Start_Ind	Bit	Motor start indication.	Profibus_Data_Table	P11:4/3	0
Motor_Stop	Bit	Stops motor.	Profibus_Data_Table	P11:4/4	0
Motor_Stop_Ind	Bit	Motor stop indication.	Profibus_Data_Table	P11:4/5	0

Table View

Form View

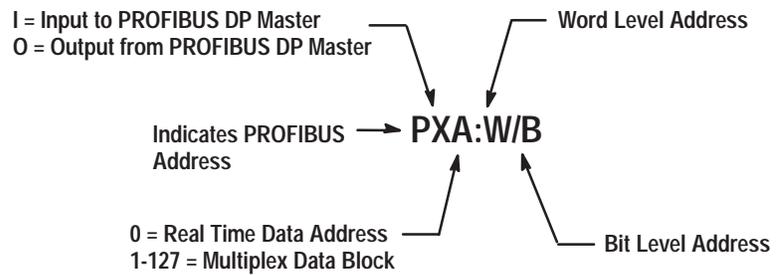
**Important:** In the tag editor, under the Options menu, make sure that Address Validation is not selected. You will get an invalid address error if you enter a PROFIBUS DP address and Address Validation is selected.

When using the tag editor (table editor format) for PROFIBUS DP tags, note the following:

- The **Node Name** field is set to PROFIBUS\_DATA\_TABLE
- The **Update Frequency** field is set to a default of 1 and cannot be changed.

### Tag Addressing

Use the following format when assigning PanelView tag addresses for PROFIBUS DP communications:



## Overlapping Input Tags



**ATTENTION:** When assigning tags, make sure that the PanelView input tag addresses do not overlap. If two tags overlap the same block location, unpredictable data will be sent to the DP Master.

The following are examples of common addressing errors:

### Example 1

Tag Tank\_temp is a floating point value at PI3:2 and tag Tank1\_level is an unsigned integer at address PI3:3. These addresses overlap and the data entered by the operator that is sent to these addresses will not be correct.

### Example 2

Tag Fill\_level is an unsigned integer at address PI0:2, tag Tank2\_level is also an unsigned integer at PI0:2. The value read by the PLC will not be what is expected. The address will always contain data from one or the other tag, it is not possible to predict which one.

### Example 3

Tag Tank3\_control is a Bit Array with a length of 3 at address PI123:3/2 and tag Tank3\_empty is a bit tag at PI123:3/3. Only one of these tags will have the correct value, but not both.

### Example 4

Tag Tank4\_fill is a bit tag at address at PI12:15/2 and tag Fill\_level is a signed integer at address PI12:15. Again, only one of these tags will have the correct value, but not both.

In some cases overlapping addresses may appear to function correctly (for example if the tag content is 0). Use the PanelBuilder tag attribute report function to check for overlapping addresses.

## Tags Using Multiple PanelView Data Base Words

Some PanelView objects, such as:

- Multistate indicators using Least Significant Bit (LSB) triggers.
- Alarms using LSB triggers.
- Piloted control lists using block write tags

can use more words of data than the tag address indicates. Keep in mind that the maximum size of the modules exchanged between the PanelView terminal and the DP Master is limited to 16 words for Real time and 15 words for Multiplex modules.

For example, a multistate indicator cannot contain 500 states. Because of the data exchange limitation, a multistate indicator is limited to 256 states (16 words \* 16 states) if located in the Real Time module and 240 (15 words \* 16 states) if located in the Multiplex module.

Another example is the Block Write feature of the Piloted Control List. You must make sure that the block write tag address is “low” enough in the module’s data area so that all words displayed on the PanelView terminal will fit into the module being returned to the DP Master.

## Transferring Application Files

Application file transfers must be made using:

- PCMCIA card
- PanelView RS-232 port

Refer to the PanelBuilder user manual for instructions.

**Note:** Application files cannot be transferred to the PanelView terminal over a PROFIBUS DP network.

## Alarms

Alarm data may be placed in either the real time or multiplex blocks. Alarm triggers and alarm message embedded variable tags must be located in a single block. A validation error will occur if alarm data is not placed in a single block. The DP Master should constantly update the block(s) containing the alarm data.

## Reports

To print out the PROFIBUS DP tag attribute report from PanelBuilder, enter the Reports menu and select the Protocol Info check box. The report lists the sizes of the data exchange modules and the tags located in each Real Time and Multiplex block.

**Note:** The PanelView application must be successfully validated before the PROFIBUS DP tag report can be generated.

## Validation Error Messages

PanelBuilder validation error messages for PROFIBUS DP applications are provided on page 36.

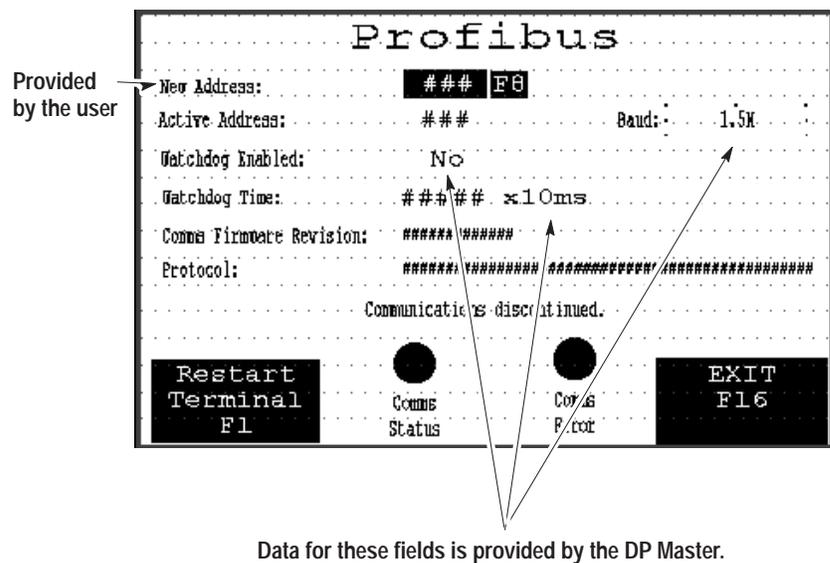
## Electronic Data Sheet (.GSD File)

A generic .gsd file is provided in the protocols/profibus directory. You can use the data sheet with any PROFIBUS application.

## Terminal Communication Setup Screen

Access the PanelView terminal configuration screen as described in your Operator Terminal user manual. To display PROFIBUS DP settings, select Communications Setup from the Configuration Mode menu.

The various communications settings and the firmware revision are then displayed. All settings except for Node Address are read only. The communications setup screen shown below is for example purposes. The setup screen you use will be slightly different based on the PanelView platform type.



### Profibus Watchdog Enabled

indicates the status of the PROFIBUS DP watchdog timer. The watchdog timer allows the PanelView slave to detect when the DP Master stops communicating. The setting is supplied by the DP Master and transferred to the PanelView at network startup. It is strongly recommended that the PROFIBUS DP Watchdog be enabled by setting the timer to a non-zero value.

### Profibus Watchdog Time (x 10 milliseconds)

indicates the watchdog timeout for the slave device. The watchdog time is supplied by the DP Master and is transferred to the PanelView terminal at network startup.

### New Address

displays the new network address that the PanelView will be set to after a reset. This is the only user changeable operating parameter. Refer to Changing the Node Address (page 32).

**Active Address**

displays the current network operating address of the PanelView. This address is originally set in the PanelView application file but may be changed by an operator.

**Baud Rate**

displays the current PROFIBUS DP network baud rate set by the DP Master. The network baud rate is automatically determined by the PanelView terminal.

**Firmware Revision:**

shows the PROFIBUS DP firmware revision level.

**Communications Status Field:**

displays the PanelView terminal's PROFIBUS DP communication status. This is the same message or error number displayed on the alert banner.

## Changing the Node Address

The Node Address downloaded with the PanelView application file will overwrite the current terminal setting. You can set a new terminal address by using the terminal PROFIBUS DP screen, however, the new address will take affect only after the terminal is reset.



**ATTENTION:** The PROFIBUS DP protocol mechanisms do not provide the ability to detect and report a duplicate node address between a DP Master and DP slave device, or between two DP slaves (only between two DP Masters).

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**Note:** The following procedure assumes the use of a keypad terminal. If you have a PanelView with a touch screen, touch the displayed item you want to change.

To manually change the node address:

1. Press [F8].

The numeric entry scratchpad is displayed.

2. Enter the new address in the scratchpad and press the Enter key.
3. Verify that the correct address is displayed in the New Address field.
4. Press [F1] to restart the terminal.

The terminal will restart with the new address.

5. Both the current and new address fields will display the new address setting.

## Troubleshooting

The following pages provide information relating only to PROFIBUS DP communications. For all other operating problems, refer to the PanelView user manual (Publication 2711-6.1). If the problem has an associated error or warning message, refer to the sections on Error and Warning Messages.



**ATTENTION:** The PanelView contains line voltages. Make sure that no objects are inserted or fall into the terminal through the ventilation slots. Always disconnect power when checking wiring connections. Failure to take adequate precautions may result in severe electrical shock.

## Terminal Reminder, Error, and Warning Codes

The following table lists error and warning messages specific to PROFIBUS DP communications. For all other messages, refer to the PanelBuilder User Manual (Publication 2711-6.0). There are three types of codes:

- Reminder Messages indicate a minor fault or mistake. Reminder messages appear when an invalid operation is attempted.
- Warning Messages indicate an operation that may produce undesirable results. You must respond to (acknowledge) a warning message.
- Critical Messages indicate there is a condition which prevents further operation. The current application will halt. The terminal must be reset to recover from this type of error.

### Alerts

Alert Number	Meaning	Type	Corrective Action(s)
0	Comms OK. Slave in data-exchange state, locked. No message will appear in this case!	None	
1	The application has not defined any external channels. Therefore, the PanelView will not start communications with the PROFIBUS network. Note: The comms "status" will indicate "OK" since this is not an error.	Displayed on the configuration screen only.	1. Make sure a PanelView application is loaded. 2. Verify that the PanelView application contains data exchange modules.
2	Services requested by the DP Master are not supported. The slave is unlocked.	Comms Warning	1. The PanelView does not support freeze mode or synch mode. Make sure your DP Master does not request these.
3	The DP Master is no longer communicating with the PanelView.	Comms Warning	1. Check cable connections. 2. Make sure DP Master is operating.
4	Comms enabled. The DP Master is not sending data. The slave is unlocked.	Comms Warning	1. Make sure the DP Master is sending data correctly.
5	A DP Master is on the network, but is not communicating with the PanelView.	Comms Warning	1. Make sure the PanelView address is the one the DP Master expects. 2. If multiple DP Masters are on the network, make sure the DP Master connected to the PanelView is operating.
6	PROFIBUS DP watchdog time-out occurred. The slave is unlocked.	Comms Warning	1. Check cable connections. 2. Make sure DP Master is operating.

Alert Number	Meaning	Type	Corrective Action(s)
7	The DP Master is in 'clear' mode.	Comms Warning	1. Place DP Master in operate mode.
8	The PanelView was just locked by a DP Master.	Comms Warning	No action required.
9	DP Master requested an unexpected block.	"Reminder" Message.	<ol style="list-style-type: none"> <li>1. Make sure the DP Master's code only requests blocks defined by the PanelView application.</li> <li>2. Check that the correct PanelView application is loaded for the DP Master.</li> <li>3. Check the extended diagnostics to obtain the block number that caused the problem.</li> </ol>
10	DP Master sent an unexpected block.	"Reminder" Message.	<ol style="list-style-type: none"> <li>1. Make sure the DP Master's code only sends blocks defined by the PanelView application.</li> <li>2. Check that the correct PanelView application is loaded for the DP Master.</li> <li>3. Check the extended diagnostics to obtain the block number that caused the problem.</li> </ol>
11	No DP Master on the wire or cable is disconnected.	Comms Warning	<ol style="list-style-type: none"> <li>1. Check cable connections.</li> <li>2. Make sure DP Master is operating.</li> </ol>
12	Check configuration error. The slave is unlocked (refer to glossary).	Comms Warning	<ol style="list-style-type: none"> <li>1. Make sure the DP Master is configured correctly for the loaded PanelView application. The expected configuration may be found in the extended diagnostics.</li> <li>2. Check that the correct PanelView application is loaded for the DP Master.</li> </ol>
13	Set parameter error. The slave is unlocked.	Comms Warning	<ol style="list-style-type: none"> <li>1. Verify the WD value is valid.</li> <li>2. Verify that the system reaction time is valid.</li> <li>3. Verify the identification number is valid.</li> <li>4. Verify that the user parameter data length is correct.</li> </ol>
14	A type error was detected in the configuration bytes sent by the DP Master. The slave is unlocked.	Comms Warning	<ol style="list-style-type: none"> <li>1. Check extended diagnostics for more information.</li> </ol>
15	A consistency error was detected in the configuration bytes sent by the DP Master. The slave is unlocked.	Comms Warning	<ol style="list-style-type: none"> <li>1. Check extended diagnostics for more information.</li> </ol>
16	A format error was detected in the configuration bytes sent by the DP Master. The slave is unlocked.	Comms Warning	<ol style="list-style-type: none"> <li>1. Check extended diagnostics for more information.</li> </ol>
17	A length error was detected in the configuration bytes sent by the DP Master. The slave is unlocked.	Comms Warning	<ol style="list-style-type: none"> <li>1. Check extended diagnostics for more information.</li> </ol>
18	SPC fault.	Critical Fault.	<ol style="list-style-type: none"> <li>1. Reset the PanelView. If this condition persists, the PROFIBUS communication card needs to be replaced. Contact Allen-Bradley for service.</li> </ol>
19	One or more startup tests failed.	Critical Fault.	<ol style="list-style-type: none"> <li>1. Reset the PanelView. If this condition persists, the PROFIBUS communication card needs to be replaced. Contact Allen-Bradley for service.</li> </ol>
20	Internal error.	Critical Fault	Contact Allen-Bradley for assistance.

## Extended Diagnostic Bytes

Profibus DP provides a 32 byte diagnostic service (the PanelView manages and transfers only 20 bytes). Bytes 1 through 6 are defined by the PROFIBUS DP standard. Bytes 7 through 20 of the diagnostic data are PROFIBUS DP–Slave specific. The PanelView extended diagnostics are defined as follows:

Byte	Description
7	This is the header byte. Per the DP standard, bits 6 & 7 are 0 which indicates device related diagnostics. Bits 0 through 5 contain the length of the extended-diagnostics including this byte. The length is fixed at 14 bytes.
8 & 9	The number of the fault that has occurred (if any).
10	The following bits are set, if the corresponding conditions apply. Bit 0 – The PanelView was locked by the DP Master, but communications from the DP Master ceased. This code will be available to the DP Master once communications have been restored.
11	The value of an invalid output block number received by the PanelView in the multiplex command word.
12	The value of an invalid input block number received by the PanelView in the multiplex command word.
13	The following bits are set if a type error was detected in the Check–Config request for one or more of the modules. Bit 0 – The Type of Module 1 is incorrect. Bit 1 – The Type of Module 2 is incorrect. Bit 2 – The Type of Module 3 is incorrect. Bit 3 – The Type of Module 4 is incorrect.
14	The following bits are set if a consistency error was detected in the Check–Config request for one or more of the modules. Bit 0 – The Consistency of Module 1 is incorrect. Bit 1 – The Consistency of Module 2 is incorrect. Bit 2 – The Consistency of Module 3 is incorrect. Bit 3 – The Consistency of Module 4 is incorrect.
15	The following bits are set if a format error was detected in the Check–Config request for one or more of the modules. Bit 0 – The Format of Module 1 is incorrect. Bit 1 – The Format of Module 2 is incorrect. Bit 2 – The Format of Module 3 is incorrect. Bit 3 – The Format of Module 4 is incorrect.
16	The following bits are set if a length error was detected in the Check–Config request for one or more of the modules. Bit 0 – The Length of Module 1 is incorrect. Bit 1 – The Length of Module 2 is incorrect. Bit 2 – The Length of Module 3 is incorrect. Bit 3 – The Length of Module 4 is incorrect.
17	Module configuration of the Real Time Output module.
18	Module configuration of the Real Time Input module.
19	Module configuration of the Multiplexed Output module.
20	Module configuration of the Multiplexed Input module.

## PanelBuilder Error Messages

### Validation Messages

Validation Message	Recommendation(s)
Missing ':' after PI / POxxx specifier.	Add colon to tag addresses.
Bad Word number. Word number range is 0 - 15.	Specify word number from 0 to 15.
Bad Bit number. Bit number range is 0 - 15.	Specify bit number from 0 to 15.
Bad character used as bit delimiter. The bit delimiter is a '/	Use correct delimiter in tag addresses.
Invalid length. Bit arrays cannot cross word boundaries.	Specify different bit array in tag address.
Direction definition (write/read) must match PI/PO.	PI = DP Master Read, PO = DP Master Write
Extra characters following a valid address.	Delete extra address characters.
No bit field allowed when Tag Type is not Bit.	Tag type and data type must be compatible.
Character string is out of PI/PO boundary.	Do not exceed the data block word boundary.
This float data is out of the PI/PO boundary.	The maximum word number for a float is 14.
For PI/PO 1 to 127, WORD#0 is reserved. Word range is 1-15.	Note: Word 0 is multiplex module command or status word.
PI/PO number is missing. Define a number after the section PI or PO.	Specify a number from 0 to 127.
Bad Word number. Word number range is 1-15.	For block numbers >0 (multiplex blocks), specify a word number from 1 to 15.
This data is out of the PI/PO boundary.	Do not exceed the data block word boundary.
Cannot be converted to current protocol format	

### Warning Messages

Validation Message	Recommendation(s)
The total size of the Input Modules is larger than 32 bytes.	Information message.
The total size of the Output Modules is larger than 32 bytes.	Information message.
Communication settings have never been initialized.	Indicates the default node address was not changed.

## Network Connection Failures

The operation of the PanelView terminal during a network connection failure depends upon the configuration of the PROFIBUS Watchdog Timer.

### Watchdog Enabled

If a non-zero watchdog timeout value has been set up then the following actions will occur when the watchdog timer expires (even if the network failure had been detected by the PanelView before the timer expired):

1. Alert message 6 (watchdog timeout occurred) will be displayed.
2. In the Communications Setup screen the Comms Status LED will flash, the Watchdog Enabled field will indicate "No", the Watchdog Time field will show "0 x 10ms", and the Baud field will show "Not Found".

When the connection between the DP Master and PanelView terminal is re-established, then the alert message will be removed without operator intervention.

### Watchdog Disabled

If a zero watchdog timeout value has been set up then the following actions will occur as soon as the network failure is detected:

1. Alert message 3 (DP Master no longer communicating with the PanelView) will be displayed.
2. In the Communications Setup screen the Comms Status LED will flash and the Baud field will show "Not Found".

When the connection between the DP Master and PanelView terminal is re-established, then the alert message will be removed without operator intervention.



## PROFIBUS DP Network Specifications

The following specifications apply to the PanelView terminal on a PROFIBUS DP network:

### General Specifications

Item	Specification
Communication Standard	PROFIBUS – DIN 19245 Part 1, Issue 1991 and Draft DIN 19245 Part 3, Issue 1993
PROFIBUS DP Supported Baud Rates	9.6, 19.2, 93.75, 187.5, 500k bits/s and 1.5M bits/s
PROFIBUS DP Identification Number	6714 (Hex)

### Station Delay Response Times (T<sub>sdr</sub>)

Baud Rate	Minimum T <sub>sdr</sub>	Maximum T <sub>sdr</sub>
9.6k bit/s, 19.2k bit/s, 93.7k bit/s, 187.5k bit/s	11 bit times	60 bit times
500k bit/s	11 bit times	100 bit times
1.5M bit/s	11 bit times	150 bit times

### Supported DP Data Sizes

Data Type	Maximum Data Size (bytes)
Input Data	64
Output Data	64
Extended Diagnostic Data	14
User Operational Parameters	Not Used
Maximum Number of Modules	4
Maximum Required Consistency	32

### Supported DP Features

Feature	Supported/Not Supported
Freeze Mode	Not Supported
Sync. Mode	Not Supported
Auto Baud	Supported
Set Slave Address	Not Supported

## European Union Directive Compliance



If the PanelView Operator Terminal is installed within the European Union or EEA regions and has the CE mark, the following regulations apply.

### EMC Directive

#### Monochrome Terminals

This apparatus is tested to meet Council Directive 89/336/EEC Electromagnetic Compatibility (EMC) using the following standards, in whole or in part:

- EN 50081-2:1993 EMC – Generic Emission Standard, Part 2 – Industrial Environment
- EN 50082-2:1995 EMC – Generic Immunity Standard, Part 2 – Industrial Environment

The product described is intended for use in an industrial environment.

#### Color Terminals

This apparatus is tested to meet Council Directive 89/336/EEC Electromagnetic Compatibility (EMC) using the following standards, in whole or in part:

- EN 50081-1:1992 EMC – Generic Emission Standard, Part 1 – Residential, Commercial and Light Industry
- EN 50082-2:1995 EMC – Generic Immunity Standard, Part 2 – Industrial Environment

The product described is intended for use in an industrial, light industrial or commercial environment.

## Intended Use of Product

According to these Standards, the factor which determines, for EMC purposes, whether an apparatus is deemed to be “Industrial” or “Residential, commercial and light industrial”, is given in Clause 1 of EN50081-2 as follows:

Apparatus covered by this standard is not intended for connection to a public mains network but is intended to be connected to a power network supplied from a high- or medium-voltage transformer dedicated for the supply of an installation feeding a manufacturing or similar plant.

The PanelView monochrome terminals are intended for use solely in an industrial environment as defined above. When installed in Europe, any other application is in contravention of European Union Directives, and a breach of these laws.

## Wiring Recommendations

To reduce electrical noise, connect the PanelView terminal to its own branch circuit. The input power source should be protected by a fuse or circuit breaker rated at no more than 15 Amps. Route incoming power to the PanelView terminal by a separate path from the communications cable.

Where power and communications lines must cross, they should cross at right angles. Communications lines can be installed in the same conduit as low level DC I/O lines (less than 10 Volts).

## Declarations of Conformity

Declarations of Conformity are available upon request for the PanelView terminals. Contact your local Allen-Bradley representative or distributor.

The Declarations of Conformity declare that the terminals conform to the applicable directives.

## Glossary

The following are terms you may see when working with PROFIBUS communications. Also refer to the glossary in the PanelBuilder User Manual.

### **CONSISTENCY**

The PROFIBUS DP protocol allows the association of “data consistency requirements with blocks of data exchanged between a PLC master and its slaves. A “consistent” block of data must always be read or written as a whole because contained data is not independent. For example, when a block holds both real data and data identification, or when data granularity exceeds 2 bytes (e.g. floating point data).

### **DP**

acronym for Decentralized Periphery. A German standard (DIN 19245/Part3) which specifies a simplified user interface with PROFIBUS Link Layer services and protocol for use with decentralized peripherals.

### **ELECTRONIC DATA SHEET**

a file with a .gsd extension that is created each time a PanelView application is generated. The PROFIBUS network manager may have the ability to read and automatically extract the required network information.

### **GSD**

File extension for the electronic data sheet. An electronic data sheet (.gsd) is created each time a PanelView application is created.

### **MODULE**

PROFIBUS DP nomenclature for data grouped together for transmission over the network.

### **MULTIPLEX BLOCK**

The blocks (1 through 127) that are transferred only when a request is made by the DP Master. Each multiplex block contains up to 15 words of data.

### **MULTIPLEX MODULE**

Up to 16 words of data grouped together for transmission. Each multiplex module consists of a command/status word (word 0) and a multiplexed data block up to 15 words.

### **PROFIBUS**

acronym for PROcess Field BUS. A German standard (DIN 19245 / Part 1, 2 and 3) which specifies a fieldbus for communications at the process level.

### **PANELBUILDER**

A Microsoft Windows based program for developing applications for a PanelView terminal.

**REAL TIME MODULE**

The modules that contain data blocks (input block 0 & output block 0) that are exchanged on each PROFIBUS DP scan between the DP Master and PanelView terminal.

**SLAVE LOCKED / UNLOCKED**

When multiple DP Masters try to communicate with a slave, the first DP Master device to communicate locks out communications for other masters (Slave Locked). If no masters are communicating with the slave, the slave is unlocked (Slave Unlocked).

**WATCHDOG TIMER**

A timer used to detect any loss of communications between the PanelView terminal and its master.

[www.rockwellautomation.com](http://www.rockwellautomation.com)

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